Helios Mission Support

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TDA Mission Support

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This article reports on activities of the DSN Network Operations organization in support of the Helios Project from 15 April 1978 through 15 June 1978.

I. Introduction

This article is the twenty-second in a continuing series of reports that discuss Deep Space Network support of Helios Mission Operations. Included in this article is information on Helios-1's seventh perihelion, Helios-2's fifth perihelion, and other mission-related activities.

II. Mission Operations and Status

The Helios-1 spacecraft passed through its seventh perihelion on 29 April 1978 at 06:13:30 Universal Time Coordinated (UTC). The perihelion pass was not covered by a DSN station, but rather by DSS 67/68 at Weilheim, Germany. The spacecraft was at a bit rate of 512 bits per second (bps) coded in Format 1, configured in medium power mode and with all experiments on. All spacecraft subsystems and experiments were in excellent condition.

Helios-2 passed through its fifth perihelion on 30 April 1978 at 05:08 UTC, and as was the case with Helios-1, coverage was by DSS 67/68. The bit rate was at 256 bps coded Format 2. The spacecraft was in a medium power mode and all experiments were on. All of Helios-2 subsystems and experiments appeared to be in excellent condition.

On 3 June 1978, the Helios Project requested that the DSN 64-meter stations use 20-kilowatt (kW) power for uplinking to Helios-2. The reason for this was due to the Sun-Earth-Probe (SEP) angle decreasing below 4 degrees. Since 23 May 1978, the highly active Sun began to influence uplink and downlink signals heavily, with ever-increasing frame deletions. On 3 June 1978, two commands were lost over DSS 43 (Canberra, Australia) prior to the 20-kW uplink request, which prevented the spacecraft from configuring to the gap coverage read-in bit rate. This resulted in a 13-hour loss of data. In addition to the 20-kW mode, the Project will transmit all critical commands three times, which has proved helpful in the past during similar conditions. Also, the telemetry bit rate was lowered to 128 bps, which is the lowest bit rate capable of reading out the spacecraft memory to cover gaps between stations. The above configuration will exist until mid-July,

An unexpected blackout entry occurred on 8 June 1978 over DSS 63 (Madrid, Spain). Station 63 had trouble maintaining telemetry lock at 128 bps and the situation did not improve when the rate was lowered to 64 bps. DSS 67/68 (Weilheim, Germany) was asked to acquire, and the results were the same as experienced at DSS 63. As a result, the project configured the spacecraft's memory for a 22-day storage period assuming a symmetrical exit angle, and the

spacecraft was commanded to an 8 bps read-in mode on 8 June 1978 at 18:07 UTC. The subsequent passes at DSS 43 and DSS 63 showed a very degraded signal and proved "almost blackout" conditions at an SEP angle of approximately 3.1 degrees. This region will be exited on 29 June 1978.

Overall coverage of both Helios spacecraft for this period is listed in Table 1.

III. Special Activities

A. DSN Mark III Data Subsystem (MDS) Update

As reported in the last article, DSS 11 MDS update was completed (Ref. 1) and the station placed under configuration control to support Helios flight operations on 26 April 1978. This completes the DSN MDS implementation.

B. Support of On-Board and Ground Experiments

The DSN 64-meter stations have continued practicing polarimetry and Meteorological Monitor Assembly (MMA) procedures (Ref. 1). During the blackout period of Helios-2, discussed earlier in this article, Faraday rotation data (Experiment 12) will be collected during all 64-meter Helios-2 tracks. This utilizes the same procedures for polarimetry and MMA procedures mentioned above. These data will also be correlated with pulsar data collected by the 100-meter antenna at Effelsberg, Germany, on 12, 13 and 14 June. In addition to this period of high interest, the time of closest approach (smallest SEP angle) of 17, 18 and 19 June, is most critical to experimenters and good data is hoped for.

Concerning Experiment 10 (micrometeoroid counter and analyzer), the experiment on Helios-2 was turned off on 5 June, after the experimenter suspected a problem, due to a current rise in Sensor-A of the experiment package. The date of Experiment 10 turn-on and checkout has not yet been determined at this writing.

C. German Space Operations Center (GSOC) 22-Bit-Error Polynomial Code (EPC) Conversion

In October, 1978, GSOC is scheduled to convert to 22-bit EPC to conform to the DSN 22-bit configuration. The first test of the system, referred to by GSOC as the Mission Control and Computer Center (MCCC) bypass, was conducted on 2 June 1978. Data were successfully passed from DSS 62 (Cebreros, Spain) through the high-speed switch at JPL to GSOC while in the 22-bit EPC. Future checkout of the system is planned prior to final conversion in October.

Reference

1. Goodwin, P. S., Jensen, W. N., Rockwell, R. M., "Helios Mission Support" in *The Deep Space Network Progress Report 42-45*, pp. 101-103, Jet Propulsion Laboratory, Pasadena, California, June 15, 1978.

Table 1. Helios tracking coverage

Month	Spacecraft	Station type	Number of tracks	Tracking time (hours, minutes)
April	Helios-1	26-meter	42	252:07
		64-meter	3	13:56
	Helios-2	26-meter	39	232:05
		64-meter	21	116:36
May	Helios-1	26-meter	55	333:41
		64-meter	1	5:06
	Helios-2	26-meter	22	124:00
		64-meter	29	140:20